

WHAT IS CLAIMED IS:

1 1. In a data transmission system including a wireless link for transmitting packets between an end
2 user machine and an Internet server that houses content in the form of web pages containing objects,
3 the wireless link comprising a mobile subscriber unit coupled to the end user machine and a base
4 station coupled to the server and in radio communication with the subscriber unit, a selected web
5 page on the server being retrieved in the form of web page data packets in response to web page
6 retrieval request packets, the objects on such web page being separately retrievable in the form of
7 object data packets in response to object retrieval request packets, a method of maximizing
8 transmission efficiency over the wireless link, which comprises the steps of

9 intercepting the retrieved web page data packets on the base station side of the wireless
10 link;

11 locally generating, from the intercepted retrieved web page data packets, object retrieval
12 request packets representative of the objects on the selected web page;

13 transmitting the locally generated object retrieval request packets to the server to retrieve
14 the corresponding object data packets;

15 locally storing the retrieved web page data packets and the retrieved object data packets;
16 and

17 selectively transmitting the locally stored web page data packets and at least a portion of
18 the locally stored object data packets in bundled form to the subscriber unit side of the
19 wireless link.

1 2. A method as defined in claim 1, further comprising locally storing the selectively
2 transmitted object data packets on the subscriber unit side of the wireless link for subsequent
3 retrieval by object retrieval request packets transmitted by the end user machine.

1 3. A method as defined in claim 1, in which the selective transmitting step comprises
2 transmitting all of the locally stored object data packets.

1 4. A method as defined in claim 1, in which the selective transmitting step comprises
2 transmitting the number of object data packets locally stored during a selected interval.

1 5. In a data transmission system including a wireless link for transmitting packets between
2 an end user machine and an Internet server that houses content in the form of web pages containing
3 objects, the wireless link comprising a mobile subscriber unit coupled to the end user machine and
4 a base station coupled to the server and in radio communication with the subscriber unit, a selected
5 web page on the server being retrieved in the form of web page data packets in response to web
6 page retrieval request packets, the objects in such web page being separately retrievable in the form
7 of object data packets in response to object retrieval request packets, a method of maximizing
8 transmission efficiency over the wireless link, which comprises the steps of:

9 establishing between the end user machine and the subscriber unit a first TCP connection
10 that replicates a TCP connection between the end user machine and the server;

11 establishing between the base station and the server a second TCP connection that
12 replicates a TCP connection between the end user machine and the server;

13 transmitting web page retrieval request packets to the server over a path including the first
14 TCP connection, the wireless link and the second TCP connection to retrieve web page
15 data packets representative of the selected web page;

16 intercepting the retrieved web page data packets on the base station side of the wireless
17 link;

18 locally generating, from the intercepted retrieved web page data packets, object retrieval
19 request packets representative of the objects on the selected web page;

transmitting the locally generated object retrieval request packets to the server to retrieve the corresponding object data packets;
locally storing the retrieved web page data packets and the retrieved object data packets;
and
selectively transmitting the stored web page data packets and at least a portion of the stored object data packets in bundled form to the subscriber unit side of the wireless link.

6. A method as defined in claim 5, further comprising locally storing the transmitted object data packets on the subscriber unit side of the wireless link for subsequent retrieval by object retrieval request packets transmitted by the end user machine.

7. A method as defined in claim 5, in which the transmitting step comprises forwarding the web page retrieval requests over the first TCP connection and the second TCP connection in TCP format, and forwarding such web page retrieval requests over the wireless link in a selected wireless protocol format.

8. A method as defined in claim 5, in which the first TCP connection establishing step comprises detecting, on the subscriber unit side of the wireless link, packets transmitted from the end user machine, and setting up the first TCP connection when the detected packets comprise web page retrieval request packets.

9. In a data transmission system including a wireless link for transmitting packets between an end user machine and an Internet server that houses content in the form of web pages containing at least one object, the wireless link comprising a mobile subscriber unit coupled to the end user machine and a base station coupled to the server and in radio communication with the subscriber

5 unit, a selected web page on the server being retrievable in the form of first data packets in response
6 to first retrieval request packets in TCP format, the object(s) in such web page being separately
7 retrievable in the form of second data packets in response to second retrieval request packets in TCP
8 format, a method of maximizing transmission efficiency over the wireless link, which comprises
9 the steps of:

10 detecting, on the subscriber unit side of the wireless link, first retrieval request packets
11 transmitted from the end user machine;

12 converting the detected first retrieval request packets into third retrieval request packets
13 encapsulated in accordance with a selected wireless protocol;

14 transmitting the third retrieval request packets over the wireless link;

15 re-converting the third retrieval request packets back into first retrieval request packets on
16 the base station side of the wireless link;

17 transmitting the re-converted first retrieval request packets to the server to retrieve first data
18 packets representative of the selected web page;

19 on the base station side of the wireless link, generating second retrieval request packets
20 derived from the retrieved first data packets and corresponding to the objects on the selected
21 web page;

22 transmitting the second retrieval request packets to the server to retrieve second object data
23 packets representative of the corresponding objects on the selected web page;

24 locally storing the retrieved first and second data packets;

25 selectively releasing, in bundled form, the stored first data packets and at least a portion of
26 the stored second data packets;

27 converting the released first and second data packets to third and fourth data packets,
28 respectively, the third and fourth data packets being encapsulated in accordance with the
29 selected wireless protocol; and

transmitting the third and fourth data packets to the subscriber unit side of the wireless link.

1 10. A method as defined in claim 9, further comprising the steps of re-converting the third
2 and fourth data packets back into first and second data packets, respectively, on the subscriber unit
3 side of the wireless link; locally storing the re-converted second data packets, and transmitting the
4 re-converted first data packets to the end user machine.

1 11. A method as defined in claim 9, in which the selected wireless protocol is the native
2 link-layer protocol of the wireless system.

1 12. In a data transmission system including a wireless link for transmitting packets between
2 an end user machine and an Internet server that houses content in the form of web pages containing
3 at least one object, the wireless link comprising a mobile subscriber unit coupled to the end user
4 machine and a base station coupled to the server and in radio communication with the subscriber
5 unit, a selected web page on the server being retrieved in the form of web page data packets in
6 response to web page retrieval request packets, the objects in such web page being separately
7 retrievable in the form of object data packets in response to object retrieval request packets:

8 means for intercepting the retrieved web page data packets on the base station side of the
9 wireless link;

10 means responsive to the intercepted web page-data packets for locally generating object
11 retrieval request packets for transmittal to the server to retrieve object data packets
12 representative of the objects on the selected web page;

13 means for locally storing the retrieved web page data packets and the retrieved object data
14 packets; and

15 means for selectively transmitting the retrieved web page data packets and at least a portion
16 of the object data packets in bundled form to the subscriber side of the wireless link.

1 13. A system as defined in claim 12, further comprising means for locally storing the
2 selectively transmitted object data packets on the subscriber unit side of the wireless link for
3 retrieval by object retrieval request packets transmitted by the end user machine.

1 14. In a data transmission system including a wireless link for transmitting packets between
2 an end user machine and an Internet server that houses content in the form of web pages containing
3 at least one object, the wireless link comprising a mobile subscriber unit coupled to the end user
4 machine and a base station coupled to the server and in radio communication with the subscriber
5 unit, a selected web page on the server being retrievable in the form of web page data packets in
6 response to web page retrieval request packets in TCP format, the objects in such web page being
7 separately retrievable in the form of object data packets in response to object retrieval request
8 packets in TCP format:

9 means for establishing, between the end user machine and the subscriber unit, a first TCP
10 connection that replicates a TCP connection between the end user machine and the server;

11 means for establishing, between the base station and the server, a second TCP connection
12 that replicates a TCP connection between the end user machine and the server, whereby web
13 page retrieval requests from the end user machine may be transmitted to the server over a
14 path including the first TCP connection, the wireless link and the second TCP connection
15 to retrieve web page data packets representative of a selected web page;

16 means for intercepting the retrieved web page data packets on the base station side of the
17 wireless link;

18 means responsive to the intercepted retrieved web page data packets for locally generating
19 object retrieval request packets for transmittal to the server over the second TCP connection
20 to retrieve object data packets representative of the objects on the selected web page;

21 means for locally storing the retrieved web page data packets and the retrieved object data
22 packets; and
23 means for selectively transmitting the locally stored web page data packets and at least a
24 portion of the locally stored object data packets in bundled form to the subscriber side of
25 the wireless link.

1 15. A system as defined in claim 14, further comprising means for locally storing the
2 selectively transmitted object data packets on the subscriber unit side of the wireless link for
3 retrieval by object retrieval request packets transmitted by the end user machine over the first TCP
4 connection.

1 16. In a data transmission system including a wireless link for transmitting packets between
2 an end user machine and an Internet server that houses content in the form of web pages containing
3 at least one object, the wireless link comprising a mobile subscriber unit coupled to the end user
4 machine and a base station coupled to the server and in radio communication with the subscriber
5 unit, a selected web page on the server being retrievable in the form of first data packets in response
6 to first retrieval request packets in TCP format, the objects in such web page being separately
7 retrievable in the form of second data packets in response to second retrieval request packets in TCP
8 format, apparatus for maximizing transmission efficiency over the wireless link, which comprises:

9 means for detecting, on the subscriber unit side of the wireless link, first retrieval request
10 packets transmitted from the end user machine;

11 means for converting the detected first retrieval request packets into third retrieval request
12 packets, the third retrieval request packets being encapsulated in accordance with a selected
13 wireless protocol for transmission over the wireless link;

means for re-converting the transmitted third retrieval request packets back into first retrieval request packets on the base station side of the wireless link for transmission to the server to retrieve first data packets representative of the selected web page;

means disposed on the base station side of the wireless link for generating, from the retrieved first data packets, second retrieval request packets for the objects on the selected web page for transmission to the server to retrieve the corresponding second data packets;

means for locally storing the retrieved first and second data packets;

means for selectively releasing, in bundled form, the locally stored first data packets and at least a portion of the locally stored second data packets; and

means for converting the selectively released first and second data packets to third and fourth data packets, respectively, the third and fourth data packets being encapsulated in accordance with the selected wireless protocol for transmission to the subscriber side of the wireless link.

17. A system as defined in claim 16, further comprising means disposed on the subscriber unit side of the wireless link for re-converting the fourth data packets into second data packets, and means for locally storing the re-converted second data packets for retrieval by first retrieval request packets transmitted by the end user machine over the first TCP connection.